CITY OF MOUNTAIN VIEW

MEMORANDUM

Community Development Department

DATE: March 15, 2018

TO: Council Environmental Sustainability Committee

FROM: Steve Attinger, Environmental Sustainability Coordinator
Wayne Chen, Assistant Community Development Director
Randal Tsuda, Community Development Director

SUBJECT: **2015 Community Greenhouse Gas Emissions Inventory**

PURPOSE

This memorandum presents the results of the 2015 community greenhouse gas (GHG) emissions inventory and recommended actions to reduce emissions over time.

RECOMMENDATION

Provide input on the 2015 community greenhouse gas emissions inventory and recommended actions to bring greater visibility to communitywide emissions and begin to address the gap between the City's 2015 emissions levels and its 2015 emissions reduction target.

EXECUTIVE SUMMARY

In response to the Global Warming Solutions Act of 2006 (AB 32), which requires California to reduce Statewide greenhouse gas emissions, the City Council established voluntary, absolute communitywide GHG emissions targets for the year 2012 and every five years from 2015 through 2050. These targets are a percentage reduction below 2005 baseline emissions, with the City's 2050 reduction target set at 80 percent below 2005 levels.

Between 2005 and 2015, absolute communitywide greenhouse gas emissions increased to 768,365 metric tons of carbon dioxide equivalent.[1] For 2015, the Council established a

[1] CO_2e, or CO_2 equivalent, describes how much global warming a given type and amount of greenhouse gas (e.g., carbon dioxide, methane, nitrous oxide, ozone) may cause, using the functionally equivalent amount or concentration of carbon dioxide (CO_2) as the reference.

goal of 10 percent below 2005 levels. In 2015, the community generated **768,365 MT CO_2e** in five sectors: energy, transportation, waste, water, and off-road mobile sources (construction and lawn and garden equipment). ***This level of emissions was higher than Mountain View's 2015 emissions target by 134,717 MT CO_2e, or 21.3 percent.***

The most significant sources of 2015 emissions were transportation (59.5 percent) and energy use (32.9 percent), accounting for more than 92 percent of emissions. Emissions from energy use decreased nearly 15 percent between 2005 and 2015, and water and waste emissions also went down by 38 percent and 53 percent, respectively, but these emissions reductions could not keep pace with steadily rising transportation emissions, which increased by 22 percent between 2005 and 2015.

In April 2017, Silicon Valley Clean Energy (SVCE) began providing 100 percent carbon-free power to residential and business customers in Mountain View.[2] Despite the emissions decrease this will cause, preliminary staff analysis projects that total 2020 emissions will exceed the City's 2020 reduction target by 15 percent to 22 percent, based on only factoring in SVCE.[3] Continued growth, particularly in transportation-related emissions, without significant improvements in resource efficiency or shifts to low-carbon alternatives, will increase absolute greenhouse gas emissions.

The City's Community Development and Public Works Departments each have significant efforts under way that will contribute to reducing transportation-related, communitywide GHG emissions. Examples include the North Bayshore Precise Plan, a model of sustainable development, and planned infrastructure improvements on Shoreline Boulevard. A nine-month-long Environmental Sustainability Task Force is also supporting staff in evaluating a broad range of emissions reduction efforts and recommending next steps.

In light of City Council Major Goals for Fiscal Years 2017 through 2019 related to sustainability and transportation, and with the City falling short of its 2015 GHG emissions reduction target, staff proposes for consideration a combination of analysis, more frequent GHG inventories, and a new action plan to bring greater visibility to, and

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[2] A small percentage of customers opted out of SVCE, amounting to 1.8 percent of combined residential and commercial accounts, per Don Bray, Silicon Valley Clean Energy, January 31, 2018.

[3] The two possible scenarios reflect the emissions reduction range (15 percent to 20 percent) established for the 2020 target. Assuming emissions targets of 15 percent and 20 percent below 2005 levels, projected 2020 emissions that only consider the future impact of SVCE will be 15 percent and 22 percent above the emissions target, respectively.

begin to reduce, communitywide emissions. Ultimately, new programs will be needed to address the gap between projected and target emissions levels.

BACKGROUND

Reduction Targets

In November 2009, the City Council adopted voluntary greenhouse gas emissions reduction targets for the community as a whole. ***These targets require an absolute reduction in total emissions below a baseline year (2005), regardless of residential and commercial growth.*** The targets were developed and adopted in response to the Global Warming Solutions Act of 2006 (AB 32), which requires California to reduce Statewide greenhouse gas emissions. The City established initial targets for 2012, 2015, 2020, and 2050. Subsequently, the Council adopted additional interim targets, at five-year intervals, between 2020 and 2050, to more closely track the City's progress towards meeting its 2050 target. Mountain View's communitywide greenhouse gas emissions reduction targets are shown in Table 1.

Table 1: Community Greenhouse Gas Emissions Reduction Targets

Year	**Reduction Target** (below 2005 baseline levels)
2005	N/A
2012	5%
2015	10%
2020	15% to 20%
2025	26%
2030	37%
2035	48%
2040	58%
2045	69%
2050	80%

Attachment 1 presents the Council-approved emissions reduction targets both as a percentage of 2005 emissions and as the absolute emissions levels that the targets imply.

Current City Policy Guidance

To guide its greenhouse gas emissions reduction strategies, the City has developed several policies and plans, including the following:

- **Greenhouse Gas Reduction Program (GGRP):** Created in 2012, the GGRP sets forth greenhouse gas emissions reduction targets for development projects, based on daytime service population,[4] with prescribed greenhouse gas mitigation measures to offset the environmental impacts of implementing the General Plan.

- **Climate Protection Roadmap (CPR):** The CPR, completed in September 2015, presents a projection of greenhouse gas emissions through 2050 and a number of strategies that would help the City reduce its absolute communitywide greenhouse gas emissions 80 percent below 2005 levels by 2050.

- **Municipal Operations Climate Action Plan (MOCAP):** The MOCAP, approved by Council in May 2015, guides the City's municipal operations greenhouse gas emissions reduction efforts. Like the CPR, the MOCAP provides specific strategies for reducing absolute emissions 80 percent below 2005 levels by 2050.

- **Environmental Sustainability Action Plans (ESAPs):** The first two plans, ESAP-1 and ESAP-2, guided the City's actions to meet general sustainability goals, and grew out of the City-appointed 2008 Environmental Sustainability Task Force. The current plan, ESAP-3, was developed based on actions in the CPR and MOCAP.

Current Implementation Plan for Greenhouse Gas Emissions Reductions: ESAP-3

ESAP-3 is the action plan that begins implementing the CPR and MOCAP for Fiscal Years 2016 through 2019. It includes a total of 37 new actions, with some shorter-term efficiency measures that will produce financial savings, and other larger, longer-term community-based projects, both of which will help reduce the City's greenhouse gas emissions. Many of the Fiscal Year 2016-17 and Fiscal Year 2017-18 actions have been started, and some completed; however, others have been delayed due to staffing constraints and trying to accomplish the comprehensive set of actions in ESAP-3. A status of ESAP-3 actions is included in the March 15, 2018 Council Environmental Sustainability Committee agenda, Item 6.2.

[4] Daytime service population includes both residents and workers. The GGRP approach of a per-service population emissions targets is appropriate for development projects, but absolute emissions and emissions targets are necessary for managing greenhouse gas emissions in the community as a whole.

Environmental Sustainability Task Force 2

The Environmental Sustainability Task Force 2 (ESTF-2), a Council advisory body of appointed community members who live or work in Mountain View, has been meeting since September 2017. They will continue to meet through June 2018, with the purpose of helping the City meet its climate goals by: (1) evaluating whether current City sustainability plans and goals should be modified based on new technologies and processes for addressing climate change; and (2) extending the capacity of Environmental Sustainability staff (through June 2018) in the areas of residential and business outreach and regional collaboration. ESTF-2 will recommend specific actions to reduce community greenhouse gas emissions, particularly from the transportation sector, and offset transportation emissions through increased efficiency in other sectors. These actions will be ranked and prioritized for 2020, 2025, and 2030, but their implementation is beyond the scope of ESTF-2.

RESULTS AND DATA ANALYSIS

Conducting a communitywide greenhouse gas emissions inventory involves measuring the energy, fuel, water use, and waste generated through residential and commercial activities in the community and calculating the quantity of greenhouse gases (in metric tons of carbon dioxide equivalent, or MT CO_2e) resulting from those activities. The City completed an inventory of its 2005 communitywide greenhouse gas emissions, which serves as its baseline for future years. The initial 2005 inventory was conducted in conjunction with ICLEI-Local Governments for Sustainability, an organization that specializes in climate change and greenhouse gas inventories for cities and counties. Subsequent inventories in 2012 and 2015 were conducted by Ecoshift Consulting under contract with the City.

The inventories conducted in 2005, 2012, and 2015 all use a national standard developed by ICLEI. This standard, the U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (the Protocol),[5] establishes reporting requirements and provides detailed accounting guidance for quantifying greenhouse gas emissions associated with a range of emission sources and community activities. Staff used the Protocol to examine emissions in five sectors: energy (building energy use), transportation (on-road vehicles), waste, water (use and treatment), and off-road mobile sources (construction equipment and lawn and garden equipment). Although the Protocol provides a common framework for calculating community emissions, it is important to note that any emissions inventory represents an estimate using the best

[5] ICLEI-Local Governments for Sustainability. 2013. U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Version 1.1 (2013).

available data and calculation methodologies at the time it was conducted. These estimates are subject to change as better data and calculation methodologies become available.

Adjustments to the 2005 and 2012 GHG Emissions Inventories

The original 2005 emissions inventory showed that the community generated 735,950 MT CO_2e. By 2012, these emissions had increased to 786,954 MT CO_2e. While conducting the 2015 emissions inventory, staff updated the 2005 and 2012 inventory results based on: (1) a new, more accurate transportation emissions methodology based on vehicle miles traveled rather than fuel sales (see Attachment 2); and (2) new information, better methods/models, or corrections to energy, water, wastewater, and off-road emissions (see Attachment 3).

Applying the updated transportation emissions methodology to the 2005 emissions resulted in a lower calculation of transportation-related emissions of 39,066 MT CO_2e, from 413,143 to 374,077 MT CO_2e. In addition, the 2005 inventory understated emissions from solid waste landfills and wastewater treatment. Solid waste landfill emissions increased by 1,142 MT CO_2e due to a correction in the amount of waste disposed. Wastewater treatment emissions increased by 6,027 MT CO_2e, reflecting Mountain View's full share of greenhouse gas emissions from the regional wastewater treatment plant. Together, transportation-related emissions reductions and solid waste and wastewater treatment emissions increases resulted in a net decrease in total 2005 emissions by 4.3 percent, from 735,950 to **704,054 MT CO_2e**.

For 2012, changes in estimates of transportation, water, energy, and off-road mobile emissions total 3.3 percent lower, from 786,954 to **761,306 MT CO_2e**. Adjusted 2012 emissions were 8.1 percent higher than adjusted 2005 emissions, putting Mountain View's 2012 emissions 13.8 percent above the City's 2012 emissions reduction target.

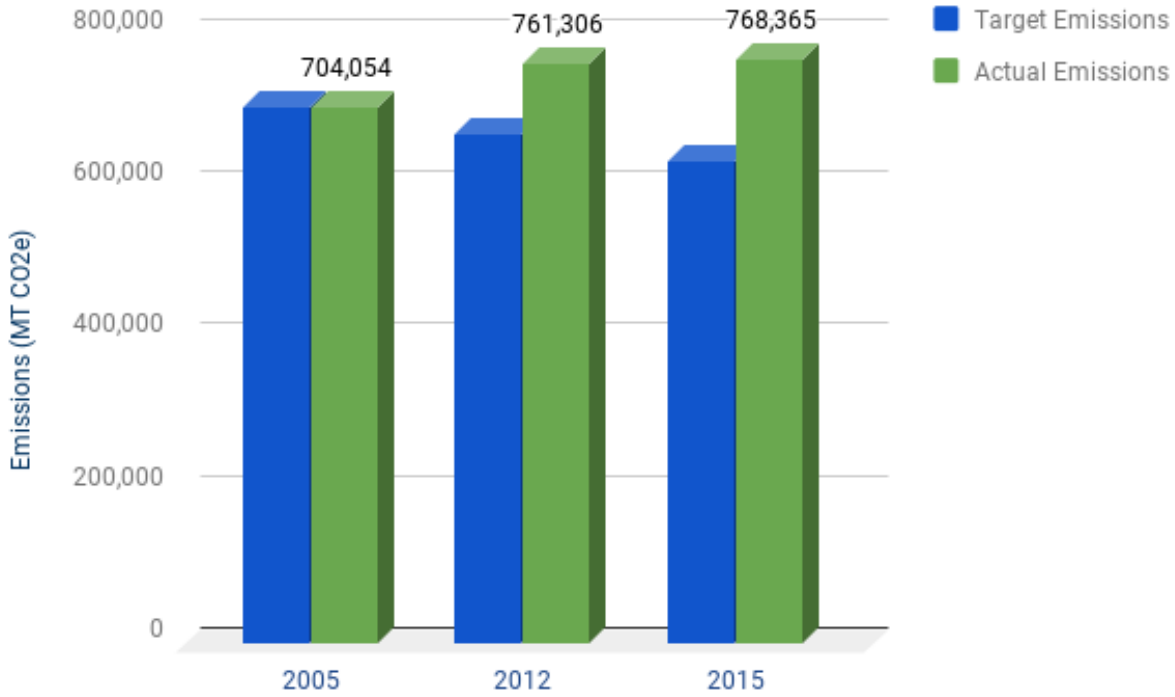
To fully understand the implications of how adjusting the City's "baseline" 2005 inventory will impact the City's ability to meet its 2050 emissions reduction target, the City would need to calculate updated emissions projections through 2050, which was beyond the scope of this greenhouse gas emissions inventory project.

2015 Community Greenhouse Gas Emissions Inventory Results

The City set its 2015 communitywide greenhouse gas emissions reduction target at 10 percent below 2005 baseline levels, or 633,648 MT CO_2e, based on the adjusted 2005 baseline. To evaluate the City's progress against this target, staff measured emissions and found that the community generated **768,365 MT CO_2e in 2015**, **a level 21.3 percent**

(134,716 MT CO_2e higher than the target level. For context, reducing these excess emissions would be equivalent to taking one-third of the community's gasoline-powered passenger vehicles off the road. Between 2005 and 2015, absolute communitywide greenhouse gas emissions increased 9.1 percent, from 704,054 to 768,365 MT CO_2e, with most of this increase occurring between 2005 and 2012 (see Figure 1). *Unless otherwise stated, all 2005 and 2012 numbers in the rest of this report reflect the adjusted figures.*

Figure 1: Total Greenhouse Gas Emissions: Adjusted Target and Actual, 2005, 2012, 2015



The most significant sources of 2015 greenhouse gas emissions were transportation (59.5 percent) and energy use (32.9 percent), as shown in Figure 2. Emissions across all three inventory years by emissions source are shown in Figure 3. Emissions from energy use, water, and waste decreased both in absolute terms and as a percentage of total greenhouse gas emissions, between 2005 and 2015, while transportation and off-road mobile emissions increased.

Figure 2: Total 2015 Greenhouse Gas Emissions by Sector (768,365 MT CO_2e)

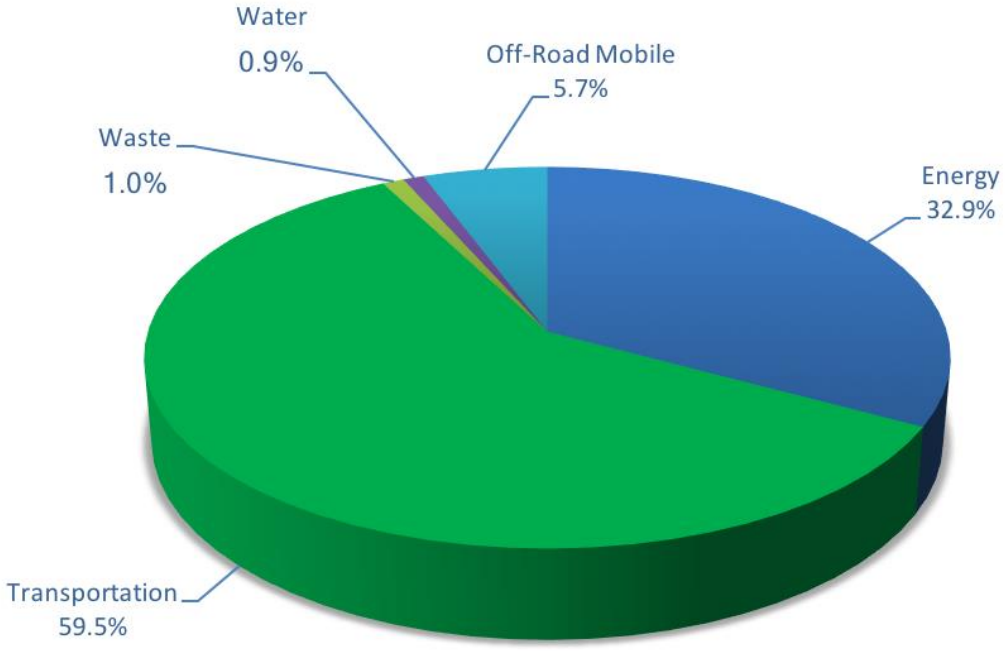
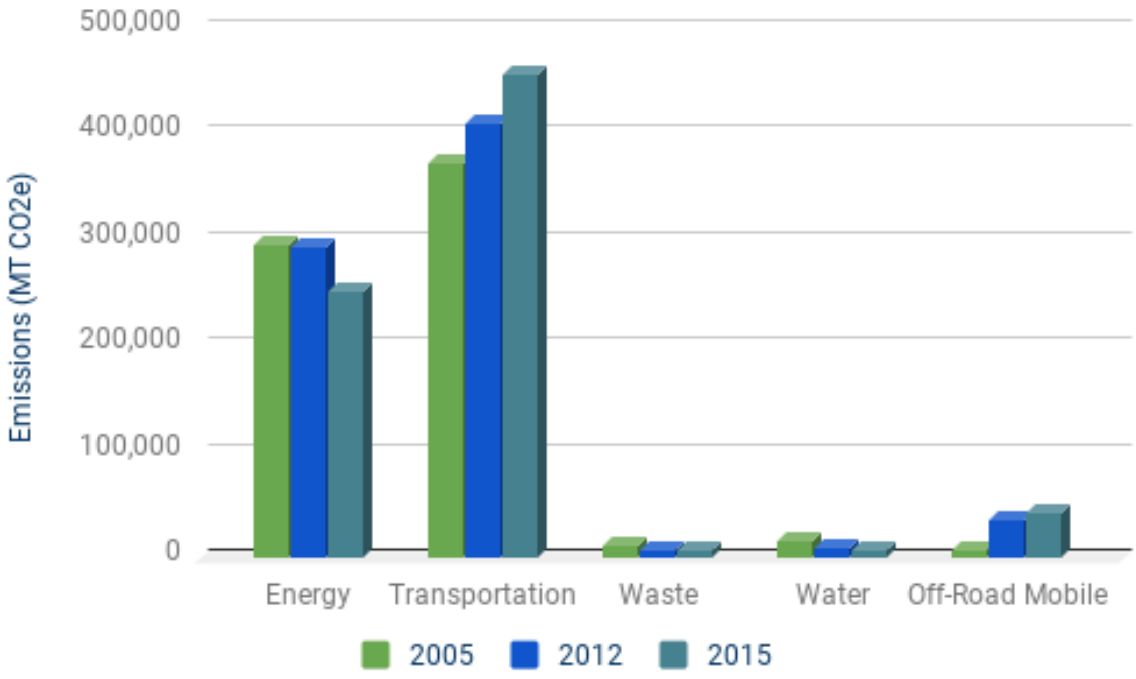


Figure 3: Comparison of Total 2005, 2012, 2015 Greenhouse Gas Emissions by Sector



Sectors in which greenhouse gas emissions decreased (building energy use, water, and waste) exceeded the 2015 reduction target (10 percent below 2005 levels), in some cases by a substantial margin (see Table 2, with more detailed data included in Attachment 4).

Table 2: Total and Percent Change in Greenhouse Gas Emissions, 2005, 2012, 2015

SECTOR	2005 GHGs (MT CO_2e)	2005 GHGs (%)	2012 GHGs (MT CO_2e)	2012 GHGs (%)	2015 GHGs (MT CO_2e)	2015 GHGs (%)	Change 2005-2012 (%)	Change 2012-2015 (%)	Change 2005-2015 (%)
Energy	295,562	42.0%	294,651	38.7%	252,776	32.9%	-0.3%	-14.2%	-14.5%
Transportation	374,077	53.1%	411,718	54.1%	456,919	59.5%	10.1%	11.0%	22.1%
Waste	12,325	1.8%	8,543	1.1%	7,592	1.0%	-30.7%	-11.1%	-38.4%
Water	15,529	2.2%	9,248	1.2%	7,281	0.9%	-40.4%	-21.3%	-53.1%
Off-Road Mobile	6,561	0.9%	37,146	4.9%	43,796	5.7%	466.2%	17.9%	567.6%
TOTAL	**704,054**	**100%**	**761,306**	**100%**	**768,365**	**100%**	**+8.1%**	**+0.9%**	**+9.1%**

Note: Numbers may not add correctly due to rounding.

A breakdown of the results of the 2015 greenhouse gas emissions inventory as well as some implications of these results are presented by sector below.

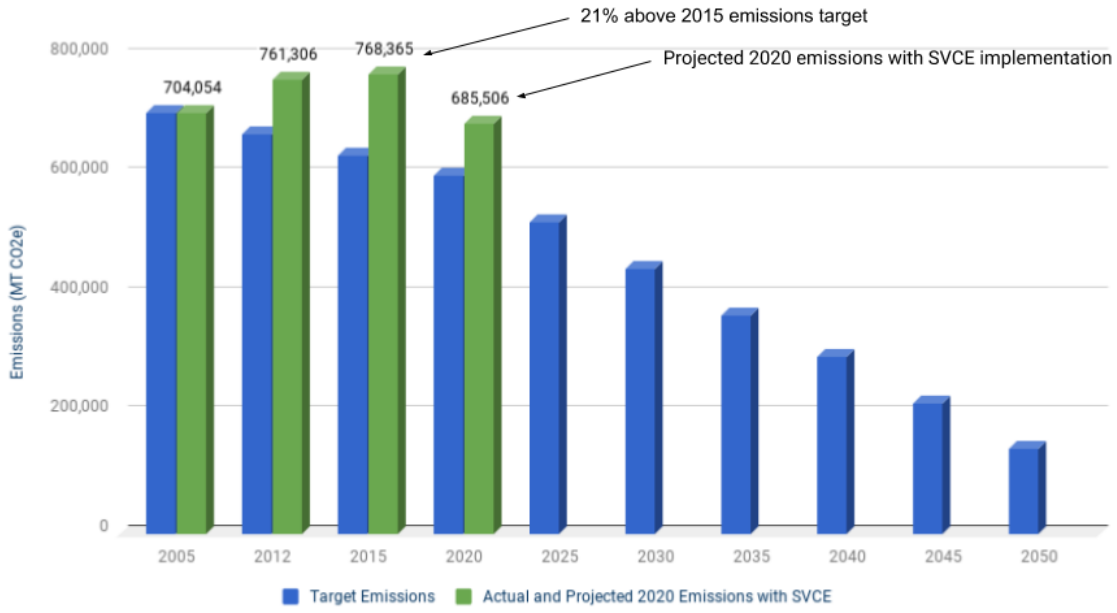
- **ENERGY (32.9 percent of total emissions):** Energy emissions decreased by nearly 15 percent between 2005 and 2015, due to reductions in both energy consumption and the electricity emissions factor (which reflects the carbon content of the electricity source).[6] Virtually all of these reductions occurred between 2012 and 2015. Beginning in April 2017, Silicon Valley Clean Energy (SVCE) began providing 100 percent carbon-free electricity to residents and businesses in Mountain View.[7] The reduction in carbon emissions due to this clean electricity will be reflected in subsequent inventories. Preliminary staff projections indicate that carbon-free electricity from SVCE will reduce Mountain View's projected 2020 electricity-related greenhouse gas emissions by approximately 95,000 MT CO_2e (from 131,000 MT CO_2e without SVCE to 36,000 MT CO_2e with SVCE). *This will*

[6] The emissions factor describes the carbon intensity of the electricity mix, which improves (i.e., decreases) as the local electric utility adds more renewable energy to its power mix.

[7] A small percentage of customers opted out of SVCE, amounting to 1.8 percent of combined residential and commercial accounts, per Don Bray, Silicon Valley Clean Energy, January 31, 2018.

result in total 2020 communitywide emissions that are 2.6 percent below 2005 levels when only considering the impact of SVCE, still far short of the City's target of 15 percent to 20 percent below 2005 emissions.[8] Instead, 2020 emissions are projected to be between 15 percent and 22 percent above the City's emissions target, based on only factoring in SVCE.[9] Figure 4 below shows the City's emissions targets as well as actual emissions for 2005, 2012, and 2015, and projected emissions for 2020 that only include the reductions associated with SVCE.

Figure 4: Comparison of Greenhouse Gas Targets to Actual and Projected 2020 Emissions that Consider SVCE [10]



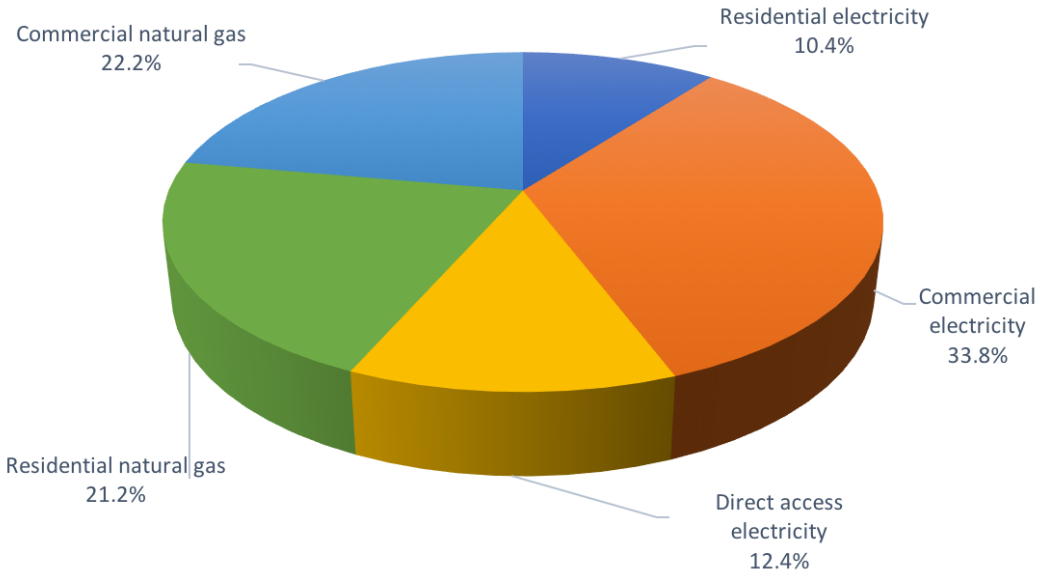
8 For the 2020 reduction target, Council set a range (15 percent to 20 percent) rather than a single figure (e.g. 15 percent).

9 The two possible scenarios reflect the emissions reduction range (15 percent to 20 percent) established for the 2020 target. Assuming emissions targets of 15 percent and 20 percent below 2005 levels, projected 2020 emissions that only consider the future impact of SVCE will be 15 percent and 22 percent above the emissions target, respectively.

10 The 2020 target assumes a 15 percent reduction off of 2005 baseline emissions (not 20 percent). The green bar for 2020 represents projected emissions based on SVCE implementation with an opt-out rate among residential and commercial accounts of 1.8 percent. Additionally, transportation and Direct Access (DA) customers are assumed to grow at a rate consistent with their growth rates from 2005 through 2015.

More than one-half of the community's energy-related greenhouse gas emissions were from electricity (56.6 percent), with the remainder from natural gas (43.4 percent) (see Figure 5). With clean electricity now available from SVCE, the City's role in encouraging reductions in natural gas use becomes critically important to achieving our greenhouse gas emissions reduction goals, such as encouraging Direct Access (DA) customers to shift to cleaner sources of power. DA electricity customers, which purchase electricity not from the regulated utility but from a competitive electric service provider, accounted for 12.4 percent of total energy-related greenhouse gas emissions and 21.9 percent of emissions from electricity use. Because the sources of electricity for DA customers are less well known, the emissions are more uncertain. The inventory Protocol specifies that a regional electricity emissions factor be used for estimating emissions from DA customers, which is much higher than the emissions factor published by the regulated utility, Pacific Gas and Electric (PG&E).

Figure 5: Total 2015 Energy-Related Greenhouse Gas Emissions (252,776 MT CO_2e)

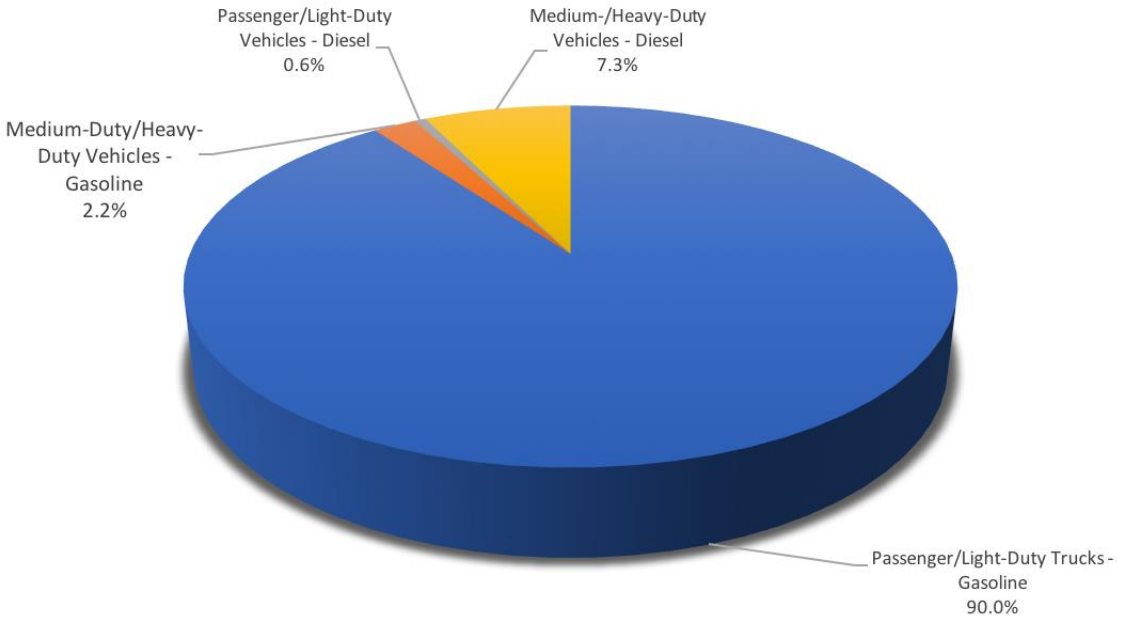


- **TRANSPORTATION (59.5 percent of total emissions):** Increases in vehicle miles traveled (VMT) and corresponding fuel consumption contributed to a 22.1 percent increase in transportation emissions between 2005 and 2015 (11.0 percent between 2012 and 2015). The City's transportation emissions include emissions from passenger vehicles and light-duty trucks, as well as medium- and heavy-duty trucks (see Attachment 2 for more information on the transportation methodology). Electric vehicles (EVs) were omitted from this analysis since the emissions related to EV charging are captured in the energy sector.

Gasoline-powered passenger vehicles and light-duty trucks generated the vast majority (90.0 percent) of the City's transportation-related greenhouse gas emissions (see Figure 6). Medium and heavy-duty diesel vehicles were the next greatest contributor at 7.5 percent of emissions. Getting people out of single-occupancy vehicles should be the primary focus of City efforts to reduce greenhouse gas emissions. Planning efforts and transportation infrastructure initiatives that make it easier for people to walk, bike, and take transit, or share vehicles, are key to increasing our community's success in achieving its near- and long-term targets. This challenge is complex, however, and requires also examining the availability of affordable housing in our community. Employees, many of whom travel significant distances to Mountain View, now outnumber residents.

The City's Public Works and Community Development Departments each have significant efforts under way that will contribute to reductions in transportation-related greenhouse gas emissions. In addition, as described in the "Background" section of this memo, a nine-month-long Environmental Sustainability Task Force 2 (ESTF-2) is assisting staff by evaluating current and planned emissions reduction efforts and recommending appropriate changes in order for the City to more likely meet its 2020, 2025, and 2030 emissions reduction targets. The Public Works and Community Development Department efforts are described in Attachment 5.

Figure 6: Total 2015 Transportation-Related Greenhouse Gas Emissions (456,919 MT CO_2e)



- **OFF-ROAD MOBILE (5.7 percent of total emissions):** Off-road mobile emissions are from construction equipment and lawn and garden equipment. This sector increased more than fivefold from 2005 to 2015 and 17.9 percent from 2012 to 2015. To compute off-road emissions, County-level emissions for construction equipment were downscaled to Mountain View based on the proportion of building permits in Mountain View compared to Santa Clara County. Similarly, lawn and garden equipment was downscaled to Mountain View based on the relative number of households in the City and the County. The significant increase in 2005 to 2015 construction-related off-road transportation emissions, which comprised more than 90 percent of all off-road mobile emissions, was a result of the building construction boom in Mountain View. The number of building permits issued in Mountain View in 2015 was nearly nine times those issued in 2005. Contrast that with the County, where the number of building permits increased 1.2-fold during the same period.

- **WASTE (1.0 percent of total emissions):** Emissions from waste decreased from 1.8 percent in 2005 and 1.1 percent in 2012 to 1.0 percent in 2015. Waste-related emissions decreased by 38.4 percent between 2005 and 2015 (11.1 percent between 2012 and 2015). The amount and type of waste landfilled are the main drivers of waste-related emissions. Materials like office paper have a relatively high emissions factor (0.20 MT of methane per wet short ton), whereas leaves have a considerably lower emissions factor (0.01 MT of methane per wet short ton of waste). Waste characterization data obtained for the 2012 inventory was considered to be similar to 2015 and was used to calculate 2015 emissions. In 2012 and 2015, a similar number of tons was landfilled and, as a result, there was little change in waste-related greenhouse gas emissions. In 2015, emissions from landfilled waste from the municipal solid waste (MSW) stream accounted for more 95.3 percent of waste-related emissions. The remaining 4.7 percent was generated by alternative daily cover (ADC) material, which is material placed on the surface of an MSW landfill at the end of each operating day to control vectors and wind-blown litter and limit fires, odors, and scavenging.

- **WATER (0.9 percent of total emissions):** Water emissions declined 53.1 percent between 2005 and 2015 (21.3 percent between 2012 and 2015). This is thought to be the result of drought education and conservation efforts that affect both water consumption and water treatment as well as efforts to reduce the carbon intensity of emissions from the wastewater treatment plant. Wastewater emissions for 2005, 2012, and 2015 were adjusted based on new information about sources of greenhouse gas emissions at the wastewater treatment plant, including natural gas used for on-site heating of office buildings and emissions from landfill gas used in incinerating bio-solids.

Characterizing Per-Resident and Per-Service Population Emissions

Mountain View experienced significant growth between 2005 and 2015: the resident population increased by 9.4 percent, while the number of employees increased by 64.8 percent, as shown in Table 3. Despite this, on a per-resident basis, emissions between 2005 and 2015 remained relatively flat, and on a per-service-population (residents plus employees) basis, emissions decreased from 5.6 to 4.6 MT CO_2e per person. While this data is informative and even encouraging, the City's goal is to reduce absolute greenhouse gas emissions. Growth without significant improvements in resource efficiency or shifts to low-carbon alternatives will continue to result in an increase in absolute greenhouse gas emissions. The 2015 data reveals that the City, with emissions at 21.3 percent above absolute reduction target levels, has work ahead to counter the effects of economic growth.

Table 3: Greenhouse Gas Emissions Relative to Resident and Service Populations

	2005	2012	2015	% Change 2005-2012	% Change 2012-2015	% Change 2005-2015
Total Emissions (MT CO_2e)	**704,054**	**761,306**	**768,365**	**8.9%**	**1.1%**	**9.9%**
Population/Employment						
Residential	70,629	75,188	77,250	6.5%	2.7%	9.4%
Employees	54,071	71,204	89,125	31.7%	25.2%	64.8%
Service Population[11]	124,700	146,392	166,375	17.4%	13.7%	33.4%
Emissions Per Unit						
Per Resident	**10.0**	**10.1**	**9.9**	1.6%	-1.8%	-0.2%
Per Service Population	**5.6**	**5.2**	**4.6**	-7.9%	-11.2%	-18.2%

[11] Service population equals residents plus employees. The primary source for demographic information is the California Department of Finance.

RECOMMENDED ACTIONS TO ADDRESS THE EMISSIONS GAP

In light of the Council Major Goals for Fiscal Year 2017 to Fiscal Year 2019 related to sustainability[12] and transportation,[13] and with the City behind in achieving its 2015 greenhouse gas emissions reduction target, staff recommends the following near-term actions to help address the gap between projected 2020 emissions and the City's 2020 emissions reduction target.

Reducing GHG emissions significantly will be difficult, particularly given the City's auto-oriented built environment, but this challenge is not unique to Mountain View. The following actions would require assistance from staff outside of Environmental Sustainability in different departments, but would establish a framework for bringing greater visibility to communitywide emissions and for revising our plan to reduce these emissions over time.

1. **Transportation GHG Analysis.** As part of developing a "Comprehensive Modal Plan," staff will include GHG emissions reductions as one of the factors considered in prioritizing corridors for infrastructure improvements and services. The evaluation of GHG emissions will be based on known effectiveness of different types of transportation improvements, strategies, and services.

2. **ESTF-2 Recommendations Analysis.** Review and conduct a cost-benefit analysis of the Environmental Sustainability Task Force 2 recommendations.

3. **ESAP-4 Development.** Based on an analysis of the Environmental Sustainability Task Force 2 recommendations, create Environmental Sustainability Action Plan 4 (ESAP-4) for Fiscal Years 2019 through 2022, prioritizing those measures with the most cost-effective greenhouse gas emissions reduction potential. Should there be ESTF-2 recommendations that staff believes are appropriate to begin in Fiscal Year 2018-19, staff will return to the Committee with proposed revisions to ESAP-3.

4. **More Frequent GHG Inventories.** The City has been conducting community greenhouse gas emissions inventories every three to five years. Staff recommends completing these inventories every two years, but with the option of extending that to three years on a case-by-case basis due to staffing constraints or changes in technology or other societal factors where delaying a year would be favorable. More frequent inventories would enable the City to more closely track its progress

[12] Promote environmental sustainability with measurable outcomes.

[13] Develop and implement comprehensive and coordinated transportation strategies to achieve mobility, connectivity, and safety for people of all ages.

against the emissions reduction targets and, as needed, adjust its sustainability programs/projects.

COMMITTEE INPUT

Staff seeks Committee input on the four recommended actions shown above or other related items.

FISCAL IMPACT

The cost of conducting the 2015 community greenhouse gas emissions inventory was approximately $20,000, excluding staff time. This included additional expenses associated with adjusting our 2005 and 2012 emissions, as described in Attachment 3. Looking forward, if greenhouse gas emissions inventories are conducted more frequently, this cost would be incurred each time. Any future programs or actions in ESAP-4 will be brought to the City Council for funding.

NEXT STEPS

Committee input on the 2015 community greenhouse gas emissions inventory and recommended actions to help address the emissions gap will be presented to the City Council in spring 2018.

SA-WC-RT/2/CDD
816-03-15-18M-E

Attachments:
1. Greenhouse Gas Emissions Reduction Targets and Levels, 2005-2050
2. Methodology for Estimating Transportation Emissions
3. Adjustments to 2005 and 2012 Greenhouse Gas Emissions Inventories
4. Total Greenhouse Gas Emissions and Percent Change in Emissions, 2005, 2012, 2015
5. Current Efforts to Reduce Transportation-Related Greenhouse Gas Emissions

cc: CDD, PWD, ACDD, APWD—Cameron, APWD—Hosfeldt, PP, ZA, FFM, SWPM, WRM, FMS, TP—Baird, TP—Kim, SP—Anderson

Attachment 1

Greenhouse Gas Emissions Reduction Targets and Levels, 2005-2050

Year	*Reduction Target (below 2005 level)*	*Emissions Level (MT CO_2e)*
2005		**704,054**
2006		699,025
2007		693,996
2008		688,967
2009		683,938
2010		678,909
2011		673,880
2012	**5%**	**668,851**
2013		657,117
2014		645,383
2015	**10%**	**633,649**
2016		626,608
2017		619,568
2018		612,527
2019		605,486
2020	**15-20%**	**598,446**
2021		583,191
2022		567,937
2023		552,682
2024		537,428
2025	**26%**	**522,173**
2026		506,919
2027		491,664
2028		476,410
2029		461,155
2030	**37%**	**445,901**
2031		430,646
2032		415,392
2033		400,137
2034		384,883
2035	**48%**	**369,628**
2036		354,374
2037		339,119
2038		323,865
2039		308,610

Year	*Reduction Target (below 2005 level)*	*Emissions Level (MT CO_2e)*
2040	**58%**	**293,356**
2041		278,101
2042		262,847
2043		247,592
2044		232,338
2045	**69%**	**217,083**
2046		201,829
2047		186,574
2048		171,320
2049		156,065
2050	**80%**	**140,811**

Note(s): *Rows in blue represent years past, while those in yellow represent future years. Reduction targets are presented for the years in which targets have been specified. Absolute emissions levels are presented for all years, based on linear interpolation between target year emissions levels.*

Methodology for Estimating Transportation Emissions

In conducting the 2015 inventory we found a number of shortcomings of the methodology used in estimating transportation emissions for the 2005 and 2012 inventories and as well as several reasons that supported moving to a new approach based on vehicle miles traveled (VMT). For the 2005 and 2012 inventories, transportation emissions were calculated based on gallons of fuel (gasoline or diesel) sold in Santa Clara County, accessed from the California Air Resources Board (CARB) EMFAC web database.[1] VMT per service population, along with resident and employee populations, from City planning staff, was used to determine total VMT in Mountain View. The proportion of Mountain View's to Santa Clara's VMTs was then used to downscale fuel usage from County to City level. And fuel intensities from EMFAC were used to convert gallons of fuel to emissions.

In 2015, we analyzed transportation emissions starting with VMT, to eliminate a step, improve accuracy, and be consistent with CARB's recommendation and the practices of surrounding communities. The 2005 and 2012 inventories were then standardized on this approach. The City's transportation emissions include passenger vehicle and light duty truck emissions as well as medium and heavy duty truck emissions. The sources of VMT data for passenger vehicles and light trucks versus medium and heavy duty trucks differ, however.

Passenger Vehicles and Light-Duty Trucks.

The passenger vehicle and light-duty truck transportation emissions were calculated from VMT using an "origin-destination" transportation demand model created by Fehr & Peers for Mountain View's Planning Department. The ICLEI Protocol recommends using local travel models where available and CARB recommends using an "origin-destination" type of model. The Fehr & Peers model produces average daily VMT as well as VMT per service population for Mountain View and includes 100 percent of the VMT that occurs within the city as well as 50 percent of the VMT that either begins or ends in Mountain View. The latter trips are considered shared trips with half of the VMT assigned to the origin city and half assigned to the destination city. "Pass through" trips, which may go through Mountain View but do not begin or end in Mountain View, such as traffic that passes through on Interstate 101, are not included in the model. The model is periodically validated with traffic counts and adjusted, as needed. The most recent adjustments to the model were completed in Fall 2017. Emissions for passenger vehicles and light-duty trucks were calculated by allocating VMT across Mountain View vehicle types using County-level vehicle proportions and

[1] California Air Resources Board (CARB), EMissions FActors Model, EMFAC2014. https://www.arb.ca.gov/emfac/2014/CARB developed the EMission FACtors (EMFAC) model to calculate statewide or regional emissions inventories for all motor vehicles operating in California.

applying relevant emissions factors to those vehicle types. Both the County-level vehicle proportions and emission factors were from EMFAC2014.

Medium- and Heavy-Duty Trucks.

Medium- and heavy-duty trucks are not included in the Fehr & Peers travel demand model, so emissions from these vehicles were calculated separately. For this data, we relied on output from the EMFAC2014 model, which produces county-level VMT data by fuel type and vehicle class. We then scaled county-level data to Mountain View using a Protocol-compliant scaling factor which considers the ratio of certain job types (indicators of medium- and heavy-duty truck use) in Mountain View to those same jobs in Santa Clara County. Emission factors from EMFAC2014, which vary by vehicle class and fuel type, were then applied to the VMT for each vehicle class to produce total emissions from medium- and heavy-duty vehicles.

VMT for electric vehicles (EVs) were omitted from overall VMTs since the emissions related to EV charging are captured in the energy sector.

Adjustments to 2005 and 2012 Greenhouse Gas Emissions Inventories

2005 GHG Emissions Inventory Adjustments

For 2005, adjustments were made to total GHG emissions in transportation, waste and and wastewater emissions. Transportation emissions from the original 2005 and 2012 inventories were adjusted to match the 2015 inventory methodology. Transportation emissions estimates for 2015 were based on vehicle miles traveled (VMT) from a local model (in the case of passenger vehicles and light-duty trucks) and from County-level VMT data (for medium- and heavy-duty vehicles). In contrast, in 2005 and 2012, fuel sales, not VMT, were used as the basis for estimating emissions. Applying the updated transportation emissions methodology to the 2005 emissions resulted in a reduction in transportation-related emissions of 39,066 MT CO_2e, from 413,143 to 374,077 MT CO_2e.

In addition, the 2005 inventory understated emissions from waste and wastewater treatment. Tons of waste disposed were under-reported at the time the 2005 inventory was completed. The updated 2005 inventory reflects an increase of 1,142 MT CO_2e from additional waste disposed. Emissions from wastewater treatment were also under-reported. Correcting this increased 2005 emissions by 6,027 MT CO2e. Taken together, reductions in transportation emissions (above) and increases in waste and wastewater treatment emissions resulted in a net decrease in total 2005 emissions of 4.3 percent, from 735,950 to 704,054 MT CO_2e.

2012 GHG Emissions Inventory Adjustments

For 2012 community-wide emissions, major adjustments were made to transportation and off-road mobile emissions. Smaller adjustments were made in emissions related to energy use, water demand, and wastewater treatment. The change in approach to estimating transportation emissions had the greatest effect on 2012 emissions. The updated transportation methodology resulted in reductions in transportation-related emissions of 67,268 MT CO_2e (from 478,986 to 411,718 MT CO_2e). Adjustments to off-road mobile emissions resulted in a significant increase in 2012 emissions of 34,640 MT CO_2e. This was due to a change in the model used to estimate these emissions and to the ratio of City to County building permits. The EPA MOVES NONROAD model, originally used to estimate off-road emissions in 2012, produced unreliable results when applied in 2015. Thus, staff elected to use CARB's OFFROAD2007 model (the tool used for the 2005 inventory) to estimate 2012 and 2015 off-road emissions. OFFROAD2007 produces County-level emissions estimates that are then scaled to Mountain View using building permit data. This ratio can have a significant effect on off-road emissions. While Santa Clara's building permits increased by about 28 percent between 2005 and 2015, the number of building permits issued in Mountain View increased by 567 percent. Most of the 34,640 MT CO_2e increase in 2012 off-road emissions arose from an increase in construction-related emissions (33,940 MT CO2e). The remaining 1,150 MT

CO_2e came from an increase in estimated lawn and garden equipment emissions. In addition, corrections to energy-related emissions in the 2012 inventory increased energy emissions by 2,711 MT CO_2e. Water-related emissions decreased by 37 MT CO_2e, and wastewater treatment emissions increased by 4,306 MT CO_2e. The latter increase was due to new information on total emissions from the wastewater treatment plant, including emissions from natural gas used for comfort heating at the plant and landfill gas used for incinerating bio-solids, both of which had not been included in the original 2012 inventory. The net impact on 2012 emissions of water- and wastewater-related changes was an increase of 4,269 MT CO_2e.

In total, changes in estimates of transportation, water, energy, and off-road emissions decreased 2012 emissions 3.3 percent, from 786,954 to 761,306 MT CO_2e. Adjusted 2012 emissions were 8.1 percent higher than adjusted 2005 emissions, putting Mountain View's 2012 emissions 13.8 percent above the City's 2012 emissions reduction target.

Total Greenhouse Gas Emissions and Percent Change in Emissions, 2005, 2012, 2015

		Year:	2005	2005	2012	2012	2015	2015
Sector	**Subsector**	**Category Units**	**Units**	**Emissions (MT CO2e)**	**Units**	**Emissions (MT CO2e)**	**Units**	**Emissions (MT CO2e)**
Energy - Residential	Electricity	kWh	162,405,140	36,307	156,495,591	31,760	147,824,933	26,348
	Natural Gas	therm	12,052,342	64,065	11,912,241	63,219	10,073,557	53,598
Energy - Commercial	Electricity	kWh	484,081,502	108,220	508,365,572	103,170	479,302,547	85,431
	Natural Gas	therm	9,783,455	52,005	11,452,623	60,935	10,537,201	56,065
Energy - Industrial	Electricity	kWh	19,269,742	4,308	NA	NA	NA	NA
	Natural Gas	therm	954,593	5,066	NA	NA	NA	NA
Energy - Direct Access	Electricity	kWh	114,469,888	25,591	120,246,452	35,566	121,214,631	31,334
	Subtotal			***295,562***		***294,651***		***252,776***
Transportation	Gas/Diesel PV/LD Trucks*	VMT	813,401,627	309,162	924,895,272	358,379	1,075,810,625	413,676
	Gas/Diesel MD/HD Trucks*	VMT	53,125,543	64,915	42,493,564	53,339	34,592,996	43,243
	Subtotal			***374,077***		***411,718***		***456,919***
Waste	Solid Waste	tons	53,850	12,248	53,515	7,224	53,620	7,238
	Alternate Daily Cover	tons	246	77	4,205	1,319	1,130	355
	Subtotal		*54,096*	***12,325***	*57,720*	***8,543***	*54,750*	***7,592***
Water	Water Demand	Mgal	4,556	4,384	3,852	2,326	3,037	1,633
	Wastewater Treatment	Mgal	3,768	11,144	2,828	6,922	2,323	5,648
	Subtotal		*8,324*	***15,529***	*6,680*	***9,248***	*5,360*	***7,281***
Off-Road Mobile	Construction			4,793		35,278		41,878
	Lawn/Garden Equipment			1,767		1,868		1,918
	Subtotal			**6,561**		**37,146**		**43,796**
TOTAL				**704,054**		**761,306**		**768,365**

	Year:	2005 to 2012	2005 to 2015	2012 to 2015	2005	2012	2015
Sector	**Subsector**	**Change in MT CO2e (%)**	**Change in MT CO2e (%)**	**Change in MT CO2e (%)**	**% of Emissions**	**% of Emissions**	**% of Emissions**
Energy - Residential	Electricity	-12.5%	-27.4%	-17.0%	5.2%	4.2%	3.4%
	Natural Gas	-1.3%	-16.3%	-15.2%	9.1%	8.3%	7.0%
Energy - Commercial	Electricity	-4.7%	-21.1%	-17.2%	15.4%	13.6%	11.1%
	Natural Gas	17.2%	7.8%	-8.0%	7.4%	8.0%	7.3%
Energy - Industrial	Electricity	NA	NA	NA	0.6%	NA	NA
	Natural Gas	NA	NA	NA	0.7%	NA	NA
Energy - Direct Access	Electricity	39.0%	22.4%	-11.9%	3.6%	4.7%	4.1%
	Subtotal	***-0.3%***	***-14.5%***	***-14.2%***	***42.0%***	***38.7%***	***32.9%***
Transportation	Gas/Diesel PV/LD Trucks*	15.9%	33.8%	15.4%	43.9%	47.1%	53.8%
	Gas/Diesel MD/HD Trucks*	-17.8%	-33.4%	-18.9%	9.2%	7.0%	5.6%
	Subtotal	***10.1%***	***22.1%***	***11.0%***	***53.1%***	***54.1%***	***59.5%***
Waste	Solid Waste	-41.0%	-40.9%	0.2%	1.7%	0.9%	0.9%
	Alternate Daily Cover	1610.2%	359.6%	-73.1%	0.0%	0.2%	0.0%
	Subtotal	***-30.7%***	***-38.4%***	***-11.1%***	***1.8%***	***1.1%***	***1.0%***
Water	Water Demand	-46.9%	-62.8%	-29.8%	0.6%	0.3%	0.2%
	Wastewater Treatment	-37.9%	-49.3%	-18.4%	1.6%	0.9%	0.7%
	Subtotal	***-40.4%***	***-53.1%***	***-21.3%***	***2.2%***	***1.2%***	***0.9%***
Off-Road Mobile	Construction	636.0%	773.7%	18.7%	0.7%	4.6%	5.5%
	Lawn/Garden Equipment	5.7%	8.5%	2.7%	0.3%	0.2%	0.3%
	Subtotal	***466.2%***	***567.6%***	***17.9%***	***0.9%***	***4.9%***	***5.7%***
TOTAL		**8.1%**	**9.1%**	**0.9%**			

Note: Numbers may not add due to rounding.

**PV/LD Trucks = Passenger Vehicle and Light Duty Trucks; MD/HD Trucks = Medium Duty and Heavy Duty Trucks*

Current Efforts to Reduce Transportation-Related GHG Emissions

The following information represents some of the major initiatives underway in Mountain View to reduce transportation-related greenhouse gas emissions. It is not an exhaustive list.

Community Development Department — Planning

One of Mountain View's primary planning initiatives over the past few years is the North Bayshore Precise Plan (Plan), a forward-thinking planning document that provides a policy framework for highly sustainable development, covering land use, water, energy, transportation, materials management, and infrastructure. The Plan includes policies and standards to reduce emissions. Additional housing units, for example, are proposed for the area to help balance land uses and make it easy for residents to live in North Bayshore without owning a private vehicle. The Plan also requires higher levels of green building performance and incentivizes highly sustainable development by granting additional floor area ratio (FAR)[1] for projects that propose improvements or help with the overall sustainable vision for North Bayshore. Improvements may include Zero Net Energy (ZNE) or LEED Platinum rating for buildings, a district energy system, and transportation improvements that increase bicycle, pedestrian, and transit use.

Specific transportation-related improvements in the North Bayshore Precise Plan include the following:

- **Single-Occupancy Vehicle (SOV) Rate.** The City has a 45 percent SOV rate for new commercial development in North Bayshore. For residential, there is a trip performance standard, as well, which is a reduced vehicle trip standard on a per unit basis.
- **Trip Caps.** The City has implemented district-wide trip caps in North Bayshore. Gateway vehicle trips are monitored twice a year to determine the success of new development requirements.
- **Transportation Demand Management (TDM) Plans.** All new development in North Bayshore is subject to TDM Plans that show how they will meet the City's trip caps, 45 percent SOV rate, and other performance standards.
- **Monitoring.** The City has established project- and district-level transportation performance monitoring programs to further document, analyze, and describe how it is implementing transportation improvements and programs that reduce vehicle trips.

[1] Floor area ratio (FAR) is the ratio of a building's total floor area to the size of land upon which it is built.

- **Transportation Management Association (TMA).** The TMA, a non-profit run by Mountain View corporations and the City, provides shuttles from Caltrain to various areas in the community, with the goal of reducing SOV trips to, and within, the City.
- **Parking.** The City has parking maximums in North Bayshore to help limit the number of private vehicles.
- **Design.** The City is planning for new transit services and facilities, greenways, and bike facilities throughout North Bayshore, as well as eliminating on-street parking and replacing it with 'curbside' zones that will allow space for shuttles, buses, carpools, and ride shares to drop off/pick up passengers.
- **District Sustainability.** The City supports district level energy, water, and waste systems that offer greater economies of scale to further reduce greenhouse gas emissions beyond just project-level measures.

The City is in the process of developing a Precise Plan for East Whisman, which is likely to include some of the policies and strategies used for North Bayshore. For areas such as El Camino and San Antonio, proposed additional land use mixes to increase non-auto travel and support public transportation in the area will help reduce greenhouse gas emissions. These areas also require TDM plans and transit subsidies, and have green building requirements.

While City planning efforts have and will continue to incorporate policies to combat transportation-related emissions, the effect on community emissions will not be realized until several years down the road. Further, the benefits of these policies may be dwarfed by increases in jobs and housing in our community.

Public Works Department — Transportation

In addition to City planning-related projects and policies to mitigate greenhouse gas emissions, several other key transportation infrastructure projects are planned or now underway. These include:

- **Shoreline Boulevard Reversible Bus Lane**. This project features a center-running reversible bus lane on Shoreline Boulevard, from W. Middlefield Road to Pear Avenue, to improve transit access to North Bayshore. The project also includes protected bicycle lanes. Construction is expected to begin in 2018.
- **Automated Guideway Transit Feasibility Study.** In early 2018, the City will complete a feasibility study that investigates automated transit from Downtown to North Bayshore. Future steps are not yet determined.
- **Castro Street Improvements.** Construction is nearly complete on a project to reduce lanes and improve pedestrian and bicycle facilities on Castro Street between El Camino Real and Miramonte Avenue. This project will make it safer and easier for students to walk and bike to Graham Middle School.

- **Stierlin Road Bicycle Improvements.** Design work is beginning for bicycle improvements on Stierlin Road and also for a pedestrian/bicycle bridge over Highway 101 at Shoreline Boulevard. These projects complement the protected bike lanes in the Shoreline Boulevard Reversible Bus Lane project, and help develop an active transportation corridor between downtown and North Bayshore.
- **Permanente Creek Trail Improvements.** Construction is nearly complete on the extension of Permanente Creek Trail from Rock Street to W. Middlefield Road.
- **San Antonio Caltrail Station Rails Project.** The Google-funded Rails project was completed in 2017, providing improved bicycle access on existing streets between the San Antonio Caltrain Station and North Bayshore.
- **Comprehensive Modal Plan.** This plan will be developed by evaluating the existing transportation-related plans and studies to identify gaps and needs, and to prioritize corridors for delivering infrastructure improvements and services. Transit and shuttle services will also be included in this evaluation. Reducing GHG emissions will be one of the factors considered in prioritizing corridors for infrastructure improvements and services, with the GHG analysis being based on known effectiveness of different types of transportation improvements, strategies, and services.